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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/599,539	08/09/2007	Shuichi Fujii	81872.0127	1506

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EXAMINER	
BOURKE, ALLISON	
ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
11/10/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/599,539	FUJII ET AL.	
	Examiner	Art Unit	
	Allison Bourke	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 August 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,8-10 and 13-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,8-10 and 13-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☒ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed on August 11, 2009 does not place the application in condition for allowance.

Remarks

2. Claims 1-6, 8-10, 13-20 are pending in the application.

3. The objection on claim 11 is withdrawn due to the applicant cancellation of the claim.

4. The 35 USC § 112 rejection on claims 6 and 18 is withdrawn due to the applicant's amendment.

5. The rejections based on Yoshimine et al. (US 2005/0199279) are withdrawn due the perfection of foreign priority document JP 2004-173177.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The phrase “a tangent line of the trajectory” is inconsistent with the accepted meanings of tangent line and trajectory, because the tangent line of a trajectory would be the same line as the trajectory. For the purposes of this office action the phrase “a tangent line of the trajectory” is interpreted to mean “the trajectory.”

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9. Claims 14 and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Fukawa et al. (US 2004/0200522).

Regarding claim 14, Fukawa discloses a solar cell module (Fig. 4) comprising: a translucent panel (12); a back surface protective member (16); a plurality of sheet-like solar cell elements (11) that are arranged between the translucent panel and the back surface protective member (Fig. 4) and electrically connected to one another [0093]; a plurality of wiring members (5, 6) for electrically interconnecting adjacent solar cell elements of the plurality of the solar cell elements [0068]; and connecting members (17) for electrically interconnecting the plurality of wiring members (Fig. 2-4), wherein the connecting members are disposed between non-light-receiving surfaces of the solar cell elements and the back surface protective member (Fig. 2c).

Regarding claim 18, Fukawa discloses all the claim limitations as set forth above and additionally discloses all the widths of the wiring members viewed from the light receiving surface side are generally identical (Fig. 3).

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1-4 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami (US 5,380,371) in view of Hanoka et al. (US 5476553).

Regarding claims 1 and 3, Murakami discloses a solar cell module (Fig. 4) comprising: a translucent panel (top 411); a back surface protective member (401); a plurality (C1/L47-51) of sheet-like solar cell elements (unit elements, C1/L47-51) that are arranged between the translucent panel and the back surface protective member (Fig. 4) and electrically connected to one another (C1/L47-51); and a filler member (410); wherein a surface electrode (108-109, 408-409) is provided on light receiving surfaces of the solar cell elements (Fig. 1B and 4), the surface electrode comprising three bus bar electrodes (109, Fig. 1C) for retrieving light-produced electric current generated at the solar cell elements to the outside (C8/L66-68) and power collecting finger electrodes (108) that are connected to the bus bar electrodes (Fig. 1C), and the finger electrodes have widths of not less than 0.05 mm (C8/L34-35).

Murakami does not explicitly disclose the filler member for filling spaces between the solar cell elements.

Hanoka discloses a solar cell module (Fig. 4-6) with a filler member (44 and 48) for filling spaces between the solar cell elements (Fig. 5 and C6/L36-45) in order to mechanically support the cells and to protect the cells against environmental degradation (C2/L50-64).

It would have been obvious to one having ordinary skill in the art at the time of the invention to use the filler between the solar cells in the device of Murakami, as taught by Hanoka to mechanically support the cells and to protect the cells against environmental degradation.

Modified Murakami does not explicitly disclose the bus bar electrodes have widths of not less than 0.5 mm and not more than 2 mm and the finger electrodes have widths of not less than 0.06 mm and not more than 0.09 mm. As the amount of incident light and electrical output ability of the electrodes are variables that can be modified, among others, by adjusting the finger electrode width, with said incident light increasing and electrical output decreasing as finger electrode width is decrease, the precise finger electrode width would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed finger electrode width cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the finger electrode width in the apparatus of modified Murakami to obtain the desired balance between the amount of incident light and the electrical output of the electrodes to efficiently collect the electric current (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (*In re Aller*, 105 USPQ 223).

Regarding claim 3, modified Murakami discloses all the claim limitations as set forth above and Murakami additionally discloses the solar cell elements each have a rectangular shape whose one side is not less than 100 mm and not more than 350 mm in length, and another side is not less than 100 mm and not more than 350 mm in length (C11/L24).

Regarding claim 4, modified Murakami discloses all the claim limitations as set forth above and Murakami additionally discloses the finger electrodes are in direct contact with the filler member (Fig. 4).

Regarding claim 13, modified Murakami discloses all the claim limitations as set forth above but does not explicitly disclose a photovoltaic power generator for extracting electric power by connecting one or a plurality of the solar cell modules.

Hanoka discloses a solar cell module wherein one or a plurality of the solar cell modules are connected for a greater power output (C2/L30-32).

It would have been obvious to one having ordinary skill in the art at the time of the invention to connect one or a plurality of the solar cell modules of modified Murakami, as taught by Hanoka for a greater power output.

3. Claims 5-6 and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami (US 5,380,371) in view of Hanoka et al. (US 5476553) in further view of Fujii et al. (US 2003/0178057).

Regarding claims 5 and 6, modified Murakami discloses all the claim limitations as set forth above and Murakami additionally discloses an opposite conductivity-type diffusion layer (103, 105) but does explicitly disclose the solar cell elements comprise

on the light receiving surface side thereof an opposite conductivity-type diffusion layer having a sheet resistance of not less than 60Ω/□ and not more than 300Ω/□ and the solar cell elements on the light receiving surface side on thereof fine irregularities having widths and heights of 2 μm or less and an aspect ratio of 0.1-2.

Fujii discloses a solar cell (Fig. 1) with a surface electrode (4) with an opposite conductivity-type diffusion layer on the surface of the semiconductor substrate having a sheet resistance of 60Ω/□-300Ω/□ that will have good electric properties [0027]. Fujii additionally discloses the solar cell having microscopic protrusions and recesses on the surface of the semiconductor substrate so as to introduce as much light incident on the solar cell as possible into the semiconductor substrate, and to trap as much light introduced into the semiconductor substrate as possible within the semiconductor substrate [0007]. Fujii also discloses the protrusions having widths and heights of 2 μm or less [0057] and an aspect ratio of 0.1-2 [0058] in order to shorten time of manufacturing [0057], optimize the reflectance and the susceptibility to being damaged during manufacturing [0058].

These references are analogous because both art is directed towards solar cells with opposite conductivity type diffusion regions and surface electrodes.

It would have been obvious to one having ordinary skill in the art at the time of the invention to have an opposite conductivity type diffusion layer with a sheet resistance of 60Ω/□-300Ω/□ because of the good electric properties. Additionally, it would have been obvious to one having ordinary skill in the art at the time of the invention to introduce irregularities in the solar cell elements of modified Murakami, as

taught by Fujii, maximized introduced light and to trap light introduced into the semiconductor substrate. Further, it would have been obvious to one having ordinary skill in the art at the time of the invention to provide the irregularities having widths and heights of 2 μm or less and an aspect ratio of 0.1-2 in the device of modified Murakami, as taught by Fujii, in order to shorten time of manufacturing, optimize the reflectance and the susceptibility to being damaged during manufacturing.

Regarding claim 8, modified Murakami discloses all of the claim limitations as set forth above and Fujii additionally discloses wherein trajectories drawn by moving edge lines of a contact surface between the electrode and the semiconductor region in the direction of an electric current flowing through the electrode include in at least a part thereof a region where the direction of a tangent line of the trajectory is not coincident with the electric current flowing direction (Fig. 1), wherein the edge lines of the contact surface between the bus bar electrodes and/or finger electrodes and the semiconductor region include a rugged contour in a planar direction of the solar cell element (Fig. 1).

Regarding claim 9, modified Murakami discloses all of the claim limitations as set forth above, but does not explicitly disclose the area of the contact surface between the finger electrodes and the semiconductor region is represented by S_1, an average value of distances between the edge lines of the contact surface within each cut surface formed by cutting at a plurality of cut planes that are generally perpendicular to the direction of electric current flowing through the finger electrode is represented by d_1, and an entire length of the edge lines is represented by L_1, the solar cell elements each include at least one finger electrode where the values S_1,d_1, and L_1 satisfy the following

relationship: $0.5L_1(S_1*d_1^{-1}+d_1)^{-1}> 1.2$. As the amount of contact surface area between the finger electrodes and semiconductor region is a variable (both dependent upon edge lines and electrode width), that can be modified, among others, by adjusting semiconductor region roughness, with said contact surface area between the finger electrode and semiconductor region increasing as roughness of the semiconductor region is increased, the precise surface roughness would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed relationship between finger electrode size and surface roughness cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the surface roughness in the apparatus of modified Murakami to obtain the desired balance between the amount of contact surface area between the finger electrode and semiconductor region (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (*In re Aller*, 105 USPQ 223).

Regarding claim 10, modified Murakami discloses all the claim limitations as set forth above and Fujii additionally discloses the profile of the edge lines of the contact surface includes at least a part where the edge lines are asymmetric with respect to a center line of the finger electrode forming the contact surface that runs in the same direction as the direction of electric current flowing through the finger electrode (Fig. 1).

4. Claims 15-17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable Fukawa et al. (US 2004/0200522).

Regarding claim 15, Fukawa discloses all the claim limitations as set forth above and additionally discloses the widths of the wiring members needs to be as small as possible for greater light-receiving area [0079], but does not disclose a sum of the areas of the plurality of solar cell elements is not less than 91.9% and not more than 97.7% of an entire area on the light receiving surface side of the solar cell module. As the solar cell cost and efficiency are variables that can be modified, among others, by adjusting said areas of plurality of solar cells elements in relation to light receiving area, with said solar cell cost increasing and efficiency decreasing as area of plurality of solar cell elements is decreased, the precise area of plurality of solar cell elements would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed areas of plurality of solar cells elements in relation to light receiving area cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, area of plurality of solar cell elements in the apparatus of modified Murakami to obtain the desired balance between said solar cell cost and efficiency (In re Boesch, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (In re Aller, 105 USPQ 223).

Regarding claim 16, Fukawa discloses all of the claim limitations as set forth above, but does not explicitly disclose the shortest distance between an end side of a solar cell element located at the outer most periphery of the plurality of arranged solar cell elements and an end of the perimeter of the solar cell module is not less than 5 mm and not more than 11 mm. As the solar cell cost and efficiency are variables that can be modified, among others, by adjusting said distance between a solar cell and the end of the module, with said solar cell cost decreasing and efficiency increasing as the distance between a solar cell and the end of the module is decreased, the precise distances would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed distance cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the distance between a solar cell and the end of the module in the apparatus of Fukawa to obtain the desired balance between said solar cell cost and efficiency (In re Boesch, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (In re Aller, 105 USPQ 223).

Regarding claim 17, Fukawa discloses all of the claim limitations as set forth above, but does not explicitly disclose the spacing between the plurality of solar cell elements is not less than 70% and not more than 143% of the widths of the wiring members. As the solar cell cost and efficiency are variables that can be modified,

among others, by adjusting said spacing, with said solar cell cost increasing and efficiency decreasing as spacing between the solar cell elements is increased, the precise spacing would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed spacing cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the spacing in the apparatus of modified Murakami to obtain the desired balance between said solar cell cost and efficiency (In re Boesch, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (In re Aller, 105 USPQ 223).

Regarding claim 19, Fukawa discloses all the claim limitations as set forth above and additionally discloses the widths of the wiring members are about 1.1-3.3 mm [0082, 0084, 0085] and the area of the wiring members needs to be as small as possible for greater light-receiving area [0079], but does not disclose the widths of the wiring members are not less than 0.8 mm and not more than 2.0 mm. As the amount of incident light and electrical output ability of the wiring members are variables that can be modified, among others, by adjusting the wiring member width, with said incident light increasing and electrical output decreasing as wiring member width is decrease, the precise wiring member width would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed wiring member width cannot be considered

critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the wiring member width in the apparatus of Fukawa to obtain the desired balance between the amount of incident light and the electrical output of the electrodes to efficiently collect the electric current (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (*In re Aller*, 105 USPQ 223).

5. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fukawa et al. (US 2004/0200522) in view of Hanoka et al. (US 5476553).

Regarding claim 20, Fukawa discloses all the claim limitations as set forth above but does not explicitly disclose a photovoltaic power generator for extracting electric power by connecting one or a plurality of the solar cell modules.

Hanoka discloses a solar cell module (Fig. 4-6) comprising: a translucent panel (42); a back surface protective member (50); a plurality of sheet-like solar cell elements (46) that are arranged between the translucent panel and the back surface protective member (Fig. 4-6) and electrically connected to one another (C6/L36-45); a plurality of wiring members (47) for electrically interconnecting adjacent solar cell elements of the plurality of the solar cell elements (C6/L36-45). Hanoka additionally discloses connecting one or a plurality of the solar cell modules for a greater power output (C2/L30-32).

It would have been obvious to one having ordinary skill in the art at the time of the invention to connect one or a plurality of the solar cell modules of Fukawa, as taught by Hanoka for a greater power output.

Response to Arguments

6. Applicant's arguments filed August 8, 2009 have been fully considered but they are not persuasive.

Regarding claim 8, applicant argues on page 10 of the Remarks that Fujii fails to teach "the edge lines of the contact surface between the bus bar electrodes and/or finger electrodes and the semiconductor region include a rugged contour in a planar direction of the solar cell element." The examiner respectfully disagrees, as discussed in the rejection, Fujii discloses the edge lines of the contact surface between an electrode (4) and the semiconductor region (1, 1a) include a rugged contour in a planar direction of the solar cell element in Figure 1 and [0066].

Regarding arguments towards claims 9 and 10 (page 10 of Remarks), applicant relies on the arguments concerning claim 8, which have been addressed above.

Regarding claim 14, applicant argues on page 11 of the Remarks that Fukawa does not disclose the connecting members are disposed between the non-light receiving surfaces of the solar cell elements and the back surface protective member. The examiner respectfully disagrees, as discussed in the rejection, Fukawa discloses the connection tabs (connecting member, 17) are provided in the solar cell module [0109], and Fig. 2 shows the connection tabs below the light receiving surface connected to the back surface electrode (wiring member, 6).

Regarding arguments towards claims 15-20 (page 11-12 of Remarks), applicant relies on the arguments concerning claim 14, which have been addressed above.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allison Bourke whose telephone number is (571)270-1232. The examiner can normally be reached on Monday-Thursday 8:30am-5pm and every other Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Basia Ridley can be reached on (571) 272-1453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. B./
Examiner, Art Unit 1795

/Jeffrey T. Barton/
Primary Examiner, Art Unit 1795
4 November 2009